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Two new species of *Bryophaenocladius* Thienemann, 1934 (Diptera, Chironomidae) from China

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Abstract

Two new species of *Bryophaenocladius* Thienemann, 1934, *B. mucronatus* **sp. n.** and *B. paricternicus* **sp. n.** are described and illustrated as males. A key to male imagines of the genus from China is presented.

Keywords

Chironomidae, *Bryophaenocladius*, new species, key, China

Introduction

The genus *Bryophaenocladius* was erected by Thienemann in 1934 with *Orthocladius muscicola* Kieffer, 1906 as type species. To date, more than 100 species have been recorded all over the world (Andersen and Schnell 2000, Ashe and Cranston 1990, Chaudhuri et al. 2001, Du and Wang 2010, Du et al. 2011, Freeman and Cranston 1980, Liu and Wang 2005, Makarchenko and Makarchenko 2006, 2009, 2011, Sæther 1973, Sæther et al. 2000, Sasa and Kikuchi 1995, Spies and Reiss 1996, Strenzke 1957, Wang 2000, Wang et al. 2001, 2004, 2006, Yamamoto 2004). So far 7 species of the genus were recorded in China, namely *B. cuneiformis* Armitage, 1987, *B. parimberbus* Du and Wang, 2010,

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B. propinquus (Brundin, 1947), *B. scanicus* (Brundin, 1947), *B. vernalis* (Goetghebuer, 1921), *B. wufengensis* Du and Wang, 2010, and *B. xinglongensis* Du and Wang, 2010.

The adult males of most *Bryophaenocladius* species can be recognized by strong and decumbent acrostichals beginning close to antepronotum; wing membrane without setae, but with coarse punctation visible at 40x magnification, squama with one to several setae; tibial spurs strongly developed, with well developed, but not divergent lateral denticles; hind tibial comb well developed; sensilla chaetica absent; tergite IX distinctive, with strongly pigmented, semi-circular band running around posterior margin; anal point projecting from setose area, large, semicircular to triangular; virga consisting of simple spines; gonostylus often distinctly broadened, strong megaseta (Cranston et al. 1989). However, there are exceptions to nearly all of these diagnostic characters. *B. psilacrus* Sæther is lacking acrostichals (Sæther 1982). Several species with bare squama (Andersen and Schnell 2000). The tibial spurs may be essentially without lateral denticles as in most Afrotropical species (Wang et al. 2001) and thus differ from the typical condition with lateral denticles separated but not as much as in *Chaetocladius* Kieffer. Tergite IX and the anal point may deviate from the typical form and it is the association of those species which are most in doubt such as *B. productus* (Freeman, 1953) (Sæther 1973).

After examinzing the type specimen of *B. bicolor* Wang, Sæther & Andersen, 2001 and the specimens of *B. ictericus* (Meigen, 1830) collected from Canada, China and Sweden, two new species from oriental China are described. A key to male imagines of *Bryophaenocladius* from China and a distribution map of genus *Bryophaenocladius* in China is presented (Fig. 1).

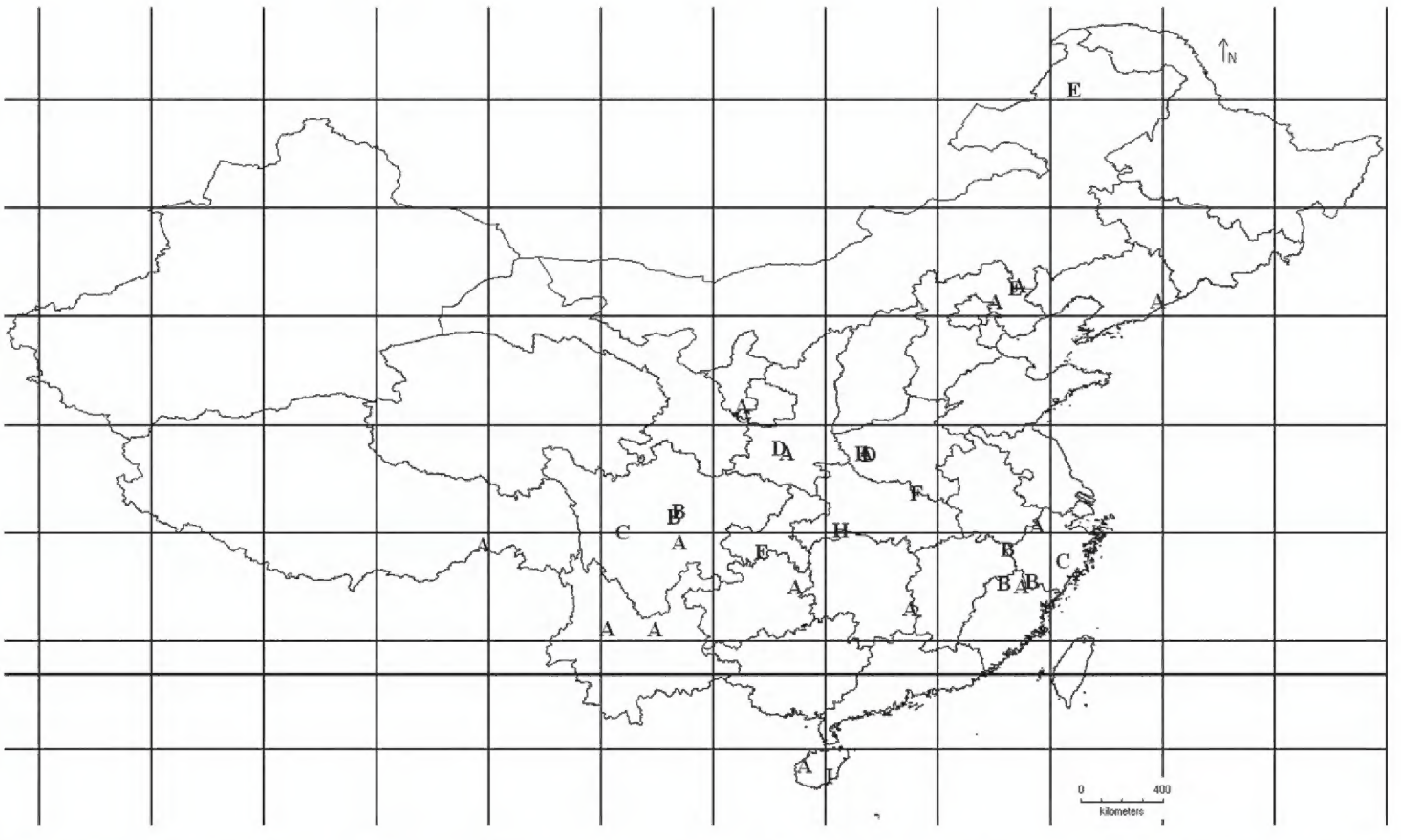

Figure 1. Distribution in China for the genus *Bryophaenocladius* **A** *B. cuneiformis* Armitage, 1987 **B** *B. mucronatus* sp. n. **C** *B. paricterícus* sp. n. **D** *B. parimberbus* Du & Wang, 2010 **E** *B. propinquus* (Brundin, 1947) **F** *B. scanicus* (Brundin, 1947). **G** *B. vernalis* (Goetghebuer, 1921) **H** *B. wufengensis* Du & Wang, 2010 **I** *B. xinglongensis* Du & Wang, 2010.

Materials and methods

The morphological nomenclature follows Sæther (1980) and the abbreviations of parts measured follow Qi et al. (2012). The material examined was mounted on slides, following the procedure outlined by Sæther (1969). Measurements are given as ranges followed by the mean, when three or more specimens are measured, followed by the number of specimens measured (n) in parentheses. Examined specimens in this study are deposited in the College of Life Science, Nankai University, China and College of Life Science, Taizhou University, China.

Key to male imagines of *Bryophaenocladius* from China

1 Third palpomere with apical projection **2**
– Third palpomere without apical projection **4**
2 Squama with setae; AR>1.0 ..... **3**
– Squama bare; AR<1.0 ..... ***B. paricterícus* sp. n.**
3 Inferior volsella unobvious ..... ***B. xinglongensis* Du & Wang, 2010**
– Inferior volsella obvious ..... ***B. cuneiformis* Armitage, 1987**
4 Squama bare **5**
– Squama setose **6**
5 Crista dorsalis absent; inferior volsella obvious ..... ***B. vernalis* (Goetghebuer, 1921)**
– Crista dorsalis present; inferior volsella unobvious ..... ***B. parimberbus* Du & Wang, 2010**
6 Anal point broad 7
– Anal point slender **8**
7 Inferior volsella finger-shaped ..... ***B. propinquus* (Brundin, 1947)**
– Inferior volsella almost rectangular ..... ***B. scanicus* (Brundin, 1947)**
8 Pseudospurs present on ta_1, ta_2 of mid and hind legs ... ***B. mucronatus* sp. n.**
– Pseudospurs absent ..... ***B. wufengensis* Du & Wang, 2010**

Taxonomy

***Bryophaenocladius mucronatus* sp. n.**
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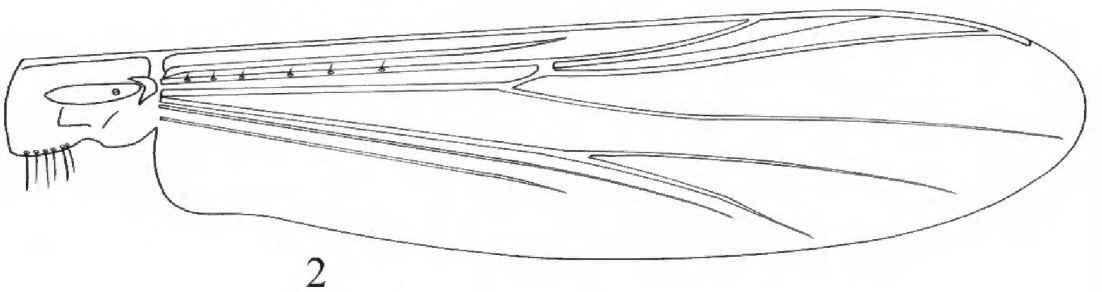
http://species-id.net/wiki/Bryophaenocladius_mucronatus
Figures 2–4

Diagnosis. The male imago can be distinguished from known species of the genus by the following combination of characters: third palpomere without apical digitiform projection; squama with 1–7, 4 setae; pseudospurs present on ta_1 and ta_2 of mid and



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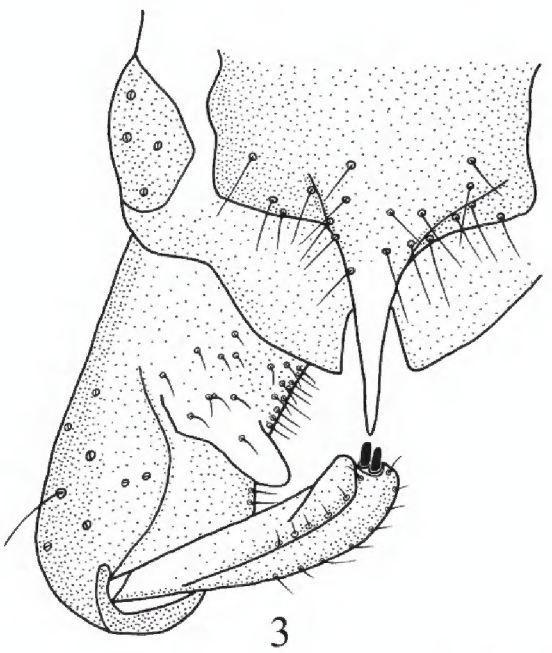

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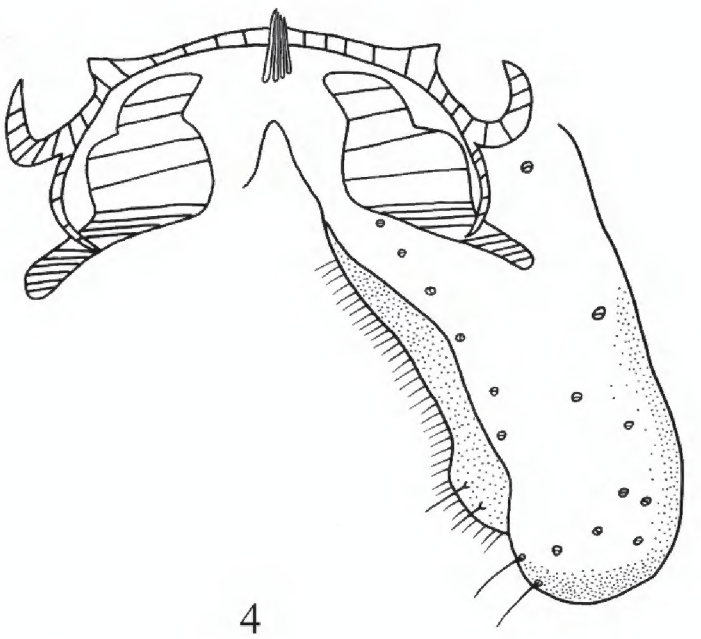

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Figures 2–4. *B. mucronatus* sp. n. **2** wing **3** hypopygium (dorsal view) **4** hypopygium (ventral view).

hind legs; anal point hyaline, slender with pointed apex; tergite IX columnar; inferior volsella thumb-shaped, with 0–5, 3 setae.

Description. Male imago (n = 29). Total length 2.20–3.00, 2.51 mm. Wing length 1.33–1.76, 1.55 mm. Total length/wing length 1.43–1.90, 1.65. Wing length/length of profemur 2.50–3.34, 2.75.

Coloration. Dark brown.

Head. AR 1.13–1.43, 1.26. Ultimate flagellomere 415–455, 430 μm long. Temporal setae 7–11, 9 including 2–4, 3 inner verticals; 4–6, 5 outer verticals and 1–2, 2 postorbitals. Clypeus with 2–5, 3 setae. Tentorium 105–150, 130 μm long, 18–25, 20 μm wide. Stipes 105–110, 108 μm long, 7–10, 8 μm wide. Palpomere lengths (in μm): 20–50, 35; 30–95, 47; 55–110, 80; 60–100, 80; 100–125, 113. L: $5^{th}/3^{rd}$ 1.40–1.82, 1.56. Third palpomere without apical digitiform projection.

Wing (Fig. 2). Anal lobe developed. Coarse punctation easily visible at 40x magnification. VR 1.16–1.33, 1.26. Costa extension 40–63, 48 μm long. Brachiolum with 1–3, 2 setae. R with 3–6, 4 setae; R_{4+5} with 0–1, 0 seta. Remaining veins bare. Squama with 1–7, 4 setae.

Thorax. Antepronotum with 3–8, 4 lateral setae. Dorsocentrals 5–13, 9; acrostichals 3–10, 7; prealars 2–5, 3. Scutellum with 2–8, 4 setae.

Legs. Spur of fore tibia 16–65, 45 μm long; spurs of mid tibia 20–40, 33 μm and 12–27, 20 μm long; spurs of hind tibia 42–58, 50 μm and 11–40, 23 μm long. Lateral denticles appressed to main shaft. Hind tibial comb with 6–16, 13 spines. Pseudospurs

present on ta_1 and ta_2 of mid and hind legs, 18–23, 20 μm long. Width at apex of fore tibia 23–38, 30 mm, of mid tibia 25–35, 27 mm, of hind tibia 30–40, 35 mm. Lengths (in μm) and proportions of legs as in Table 1.

Table 1. Lengths (in μm) and proportions of legs of *B. mucronatus* sp. n.

	P_1	P_2	P_3
fe	500–594, 553	588–650, 622	580–690, 643
ti	620–783, 723	570–704, 661	648–810, 765
ta_1	370–450, 415	240–324, 288	300–450, 415
ta_2	220–270, 240	140–190, 170	160–250, 220
ta_3	160–200, 180	105–135, 123	135–200, 173
ta_4	105–130, 118	60–90, 75	80–110, 95
ta_5	80–100, 86	60–95, 80	75–100, 88
LR	0.52–0.63, 0.57	0.42–0.48, 0.45	0.46–0.59, 0.55
BV	2.59–2.62, 2.61	3.37–3.57, 3.47	3.13–3.28, 3.19
SV	2.96–3.10, 3.03	4.32–4.58, 4.47	3.16–3.51, 3.31
BR	2.17–2.86, 2.41	2.22–3.00, 2.47	3.33–4.35, 3.81

Hypopygium (Figs 3–4). Anal point hyaline, slender, with pointed apex, 45–90, 70 μm long, 25–35, 30 μm wide. Anal point length/width: 2.14–2.71, 2.45. Tergite IX columnar, with 10–22, 15 setae, laterosernite IX with 4–8, 6 setae. Phallapodeme 45–85, 70 μm long. Transverse sternapodeme arcuate with developed oral projection, 68–100, 88 μm long. Gonocoxite 175–212, 190 μm long. Gonostylus 68–100, 87 μm long with 1–2, 1 megaseta, 8–13, 10 μm long. Crista dorsalis low. Inferior volsella thumb-shaped, 23–35, 27 μm long, with 0–5, 3 setae. Virga 10–25, 16 μm long, composed of 1–9, 5 spines. HR 1.95–2.36, 2.12. HV 2.59–3.00, 2.71.

Type materials. Holotype: ♂ (BDN. I4B20), China, Zhejiang Province: Quzhou City, Kaihua County, Gutian Mountain, 29°14'35"N, 118°06'41"E, 18.iv.2011, Lin XL, sweeping net. Paratypes (28♂♂): 2♂♂, as holotype; 1♂, Zhejiang Province, Lishui City, Qinyuan County, 27°45'08"N, 119°12'26"E, 15.iv.1994, Wu H, sweeping net; Fujian Province: 11♂♂, Wuyi Mountain, 27°38'22"N, 117°56'56"E, 26.iv.1993, Wang XH, sweeping net; Sichuan Province: 7♂♂, Wenchuan County, 30°59'27"N, 103°26'44"E, 14.vii.1987, Li XZ, sweeping net; 7♂♂, Wolong National Nature Reserve, 30°45'23"N, 103°13'55"E, 27.vii.1987, Li XZ, sweeping net.

Etymology. The species name is from Latin *mucronatus*, pointed, referring to the shape of apex of anal point.

Remarks. The present new species resembles to *B. bicolor* Wang, Sæther & Andersen, 2001 in the shape of anal point, but it can be separated from *B. bicolor* in the following combination of characters in Table 2.

Female and immature stages unknown.

Distribution. The species was found in Fujian, Sichuan and Zhejiang Provinces (Oriental China).

Table 2. Differences between *B. mucronatus* sp.n. and *B. bicolor* Wang, Sæther & Andersen, 2001.

	***B. mucronatus* sp. n.**	***B. bicolor* Wang, Sæther & Andersen, 2001**
Finger-shaped extension on third palpomere	absent	present
Seta on R_1	bare	4–5 setae
LR_1	0.52–0.63, 0.57	0.76–0.82, 0.80
Pseudospurs	present on ta_1, ta_2 of mid and hind legs	absent
Crista dorsalis	present	reduced

Bryophaenocladius paricterícus sp. n.

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http://species-id.net/wiki/Bryophaenocladius_paricterícus
Figs 5–9

Diagnosis. The male imago can be distinguished from known species of the genus by the following combination of characters: AR 0.52–0.55; third palpomere with apical digitiform projection; Costa extension 115–143, 122 μm long; squama bare; mid tibia comb with 3–7, 5 spines; anal point hyaline, slender with blunt apex; crista dorsalis absent; inferior volsella bubble-shaped, with 8–12, 9 setae.

Description. Male imago (n = 6). Total length 2.65–3.08 2.76 mm. Wing length 1.63–2.48, 2.22 mm. Total length/wing length 1.10–1.46, 1.26. Wing length/length of profemur 2.78–3.19, 3.03.

Coloration. Dark brown.

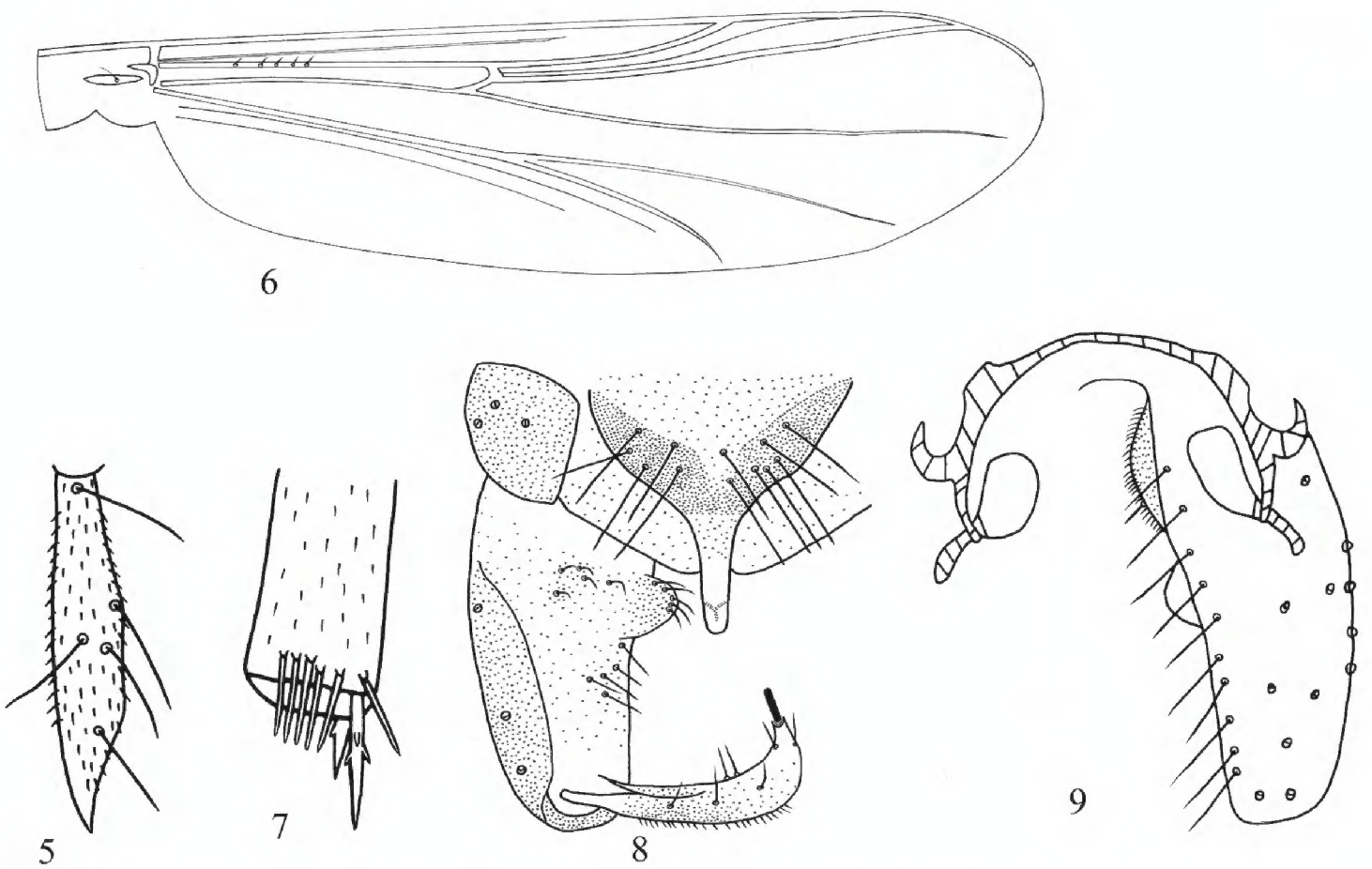
Head (Fig. 5). AR 0.52–0.55 (n = 2). Ultimate flagellomere 230–245 (n = 2) μm long. Temporal setae 3–9, 7 including 2–7, 4 inner verticals; 0–4, 2 outer verticals and 0–2, 1 postorbital. Clypeus with 4–7, 5 setae. Tentorium 109–148, 129 μm long, 15–25, 20 μm wide. Stipes 80–100, 90 μm long, 5–8, 6 μm wide. Palpomere lengths (in μm): 16–25, 20; 35–52, 41; 90–143, 114; 42–65, 57; 60–80, 71. L: $5^{th}/3^{rd}$ 0.76–0.80, 0.78. Third palpomere with apical digitiform projection.

Wing (Fig. 6). Anal lobe not developed. Coarse punctation easily visible at 40x magnification. VR 1.02–1.23, 1.17. Costa extension 115–143, 122 μm long. Brachiolum with 1 seate. R with 5–9, 7 setae. Remaining veins bare. Squama bare.

Thorax. Antepronotum with 2–5, 3 lateral setae. Dorsocentrals 8–10, 9; acrostichals 6–7, 7; prealars 2–4, 3. Scutellum with 3–7, 6 setae.

Legs (Fig. 7). Spur of fore tibia 40–58, 48 μm long; spurs of mid tibia 30–42, 38 μm and 21–32, 25 μm long; spurs of hind tibia 40–63, 52 μm and 21–32, 28 μm long. Lateral denticles appressed to main shaft. Mid tibial comb with 3–7, 5 spines; hind tibial comb with 9–14, 12 spines. Mid and hind legs without tarsal pseudospurs. Width at apex of fore tibia 35–45, 40 mm, of mid tibia 33–38, 36 mm, of hind tibia 40–48, 45 mm. Lengths (in μm) and proportions of legs in Table 3.

Hypopygium (Figs 8–9). Anal hyaline, slender with blunt apex, 40–55, 48 μm long, 15–20, 18 μm in width. Anal point length/width: 2.22–2.75, 2.51. Tergite IX



Figures 5–9. *B. paricterícus* sp. n. **5** third palpomere **6** wing **7** mid tibia **8** hypopygium (dorsal view) **9** hypopygium (ventral view).

Table 3. Lengths (in μm) and proportions of legs of *Bryophaenocladius paricterícus* sp. n.

	P_1	P_2	P_3
fe	510–893, 718	600–914, 798	620–977, 735
ti	710–1134, 916	660–987, 873	770–1260, 994
ta_1	360–670, 558	320–504, 427	400–683, 611
ta_2	240–389, 322	170–263, 232	220–315, 282
ta_3	180–273, 235	140–189, 176	180–284, 233
ta_4	100–147, 132	70–105, 98	80–126, 115
ta_5	70–108, 96	70–95, 87	70–105, 95
LR	0.51–0.64, 0.58	0.45–0.51, 0.48	0.52–0.58, 0.54
BV	2.68–2.92, 2.84	3.22–3.68-3.47	3.25–3.35, 3.30
SV	3.24–3.39, 3.31	3.94–4.11, 4.01	3.31–3.48, 3.39
BR	2.14–2.67, 2.33	2.00–2.14, 2.09	1.50–2.11, 2.01

with 6–13, 9 setae, laterosernite IX with 3–5, 4 setae. Phallapodeme 48–91, 77 μm long. Oral projection of transverse sternapodeme vestigial, 75–96, 85 μm long. Gonocoxite 170–221, 194 μm long. Gonostylus slightly curved, 80–101, 92 μm long. Megaseta 13–21, 18 μm long. Crista dorsalis absent. Inferior volsella bubble-shaped, 18–27, 22 μm long, with 8–12, 9 setae. Virga absent. HR 1.88–2.50, 2.08. HV 2.62–3.48, 3.02.

Type materials. Holotype: ♂ (BDN. K7A22), China, Zhejiang Province: Taizhou City, Xianju County, Shenxianju Scenic Area, 28°42'14"N, 120°36'25"E, 14.iv.2011, Lin XL, sweeping net. Paratypes (5♂♂): 1♂, as Holotype; Sichuan Province: 4♂♂,

Yajiang County, 30°01'52"N, 101°00'52"E, 10.vi.1996, 3050 meters above sea level, Wang XH, sweeping net.

Etymology. Named in closing to the species *B. ictericus* (Meigen, 1830).

Remarks. The present new species resembles to *B. ictericus* (Meigen, 1830) in the shape of inferior volsella, but it can be separated by following combination of characters in Table 4.

Female and immature stages unknown.

Distribution. The species was found in Sichuan and Zhejiang Provinces (Oriental China).

Table 4. Differences between *B. paricticus* sp. n. and *B. ictericus* (Meigen, 1830)

	***B. paricticus* sp. n.**	***B. ictericus* (Meigen, 1830)**
Antennal ratio (AR)	0.52–0.55	1.19–1.73, 1.56
Finger-shaped extension on third palpomere	present	absent
Length of Costal extension	115–143, 122 μm	64–105, 98 μm
Length of megaseta	13–21, 18 μm	7–14, 11 μm
Gonostylus	bended	straight
Virga	absent	present

Acknowledgements

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